AMENDMENTS TO THE SPECIFICATION

IN THE SPECIFICATION:

Page 1

Before line 1 on page 1 of the specification, please insert the following new paragraph:

This application is a Divisional of co-pending Application No. 09/694,812, filed on October 24, 2000, the entire contents of which are hereby incorporated by reference and for which priority is claimed under 35 U.S.C. § 120; and this application claims priority of Application No. 11-302462 and 11-312142 filed in Japan on October 25, 1999 and November 2, 1999, respectively under 35 U.S.C. § 119.

Page 1

The paragraph on page 1, lines 9-12, has been amended as follows:

Important subjects for a pneumatic radial tire, particularly a radial tire for a passenger car are reduction of rolling resistance, improvement of durability, reduction of the manufacturing cost, and improvement in comfortableness of the ~~car~~ vehicle.

The paragraph beginning on page 1 at line 16, through page 2, line 1, has been amended as follows:

For example, Japanese Utility Model Laying-Open No. 63-19404 (1988) proposes a technique of reducing the rolling resistance of a tire by employing not a cord but a steel wire material for a belt layer. In such a tire, however, the steel wire material is disadvantageously broken when a ~~car~~ vehicle provided with ~~the~~ such a tire repeats steep turns.

The rigidity of the belt layer dominates the deformation of the belt layer when a ~~car~~ vehicle provided with the tire is in motion, and influences the basic performance and durability of the tire. In particular, the rigidity of the belt layer influences the rolling resistance, high-speed driving performance and cornering performance as well as belt end separation resulting from cracking between plies ~~on~~ at an end portion of the belt layer caused by a load applied to the tire when the car is in motion. Therefore, prescribed rigidity of the belt layer must be ensured. The belt end separation is caused by growth of cracking of rubber resulting from stress concentrating on the end portion of the belt layer due to repetitive deformation of the belt layer when the car provided with the tire is in motion, particularly deformation of the belt layer upon cornering.

Therefore, resistance against such belt end separation is important for attaining durability of the tire.

Page 2

The paragraphs on page 2, lines 2-33, has been amended as follows:

On the other hand, a pneumatic radial tire for a truck or a bus used under sever conditions due to a high load and high-speed driving must ~~keep~~ maintain at high levels the strength of not only a cord for a belt layer but also a carcass ply cord ~~at high levels~~. In general, the carcass of such a radial tire for a truck or a bus ~~is~~ must be improved in transverse rigidity in order to maintain steering stability ~~and~~ when subjected to repetitive deformation following high-speed driving under a high load. Therefore, the carcass cord is formed by a steel cord, in order to satisfy requirement for strength and durability for sufficiently withstanding such distortion/deformation.

In general, a single-layer stranded structure of a multilayer stranded structure of 7 X 4, 3 + 7 or 3 + 8 + 13 is employed for the carcass cord of this type of tire. When such a cord densely charged with steel wires is embedded in carcass rubber, however, the rubber insufficiently penetrates into the steel cord. Therefore, when a

side wall portion is damaged by sharp stones and rocks during driving, for example, it follows that water penetrates ~~from~~ the damaged portion, which in turn serves as a starting point for diffusing moisture ~~in a clearance~~ into the space defined ~~in~~ by the steel cord, causing the creation and spreading of rust. Consequently, the adhesion between the steel cord and the rubber ~~is deteriorated~~ deteriorates and the steel cord ~~is~~ becomes broken ~~to reduce~~ which reduces the durability of the tire.

Further, the aforementioned steel cord, having a complicated structure, requires complicated manufacturing steps, ~~to result~~ which results in a high manufacturing cost for the metallic cord.

In order to solve these problems, there ~~are~~ is proposed the so-called ~~loosed~~ loose cord construction formed by stranding steel wires while defining a clearance therebetween ~~and a~~ to produce steel ~~cord~~ cords ~~prepared by stranding formed steel wires and defining~~ containing a clearance between the wires for improving the penetrability of rubber into the cord. However, such a steel cord requires a forming step as well as a stranding step for the steel wires ~~to result~~ resulting in a high manufacturing cost for the steel cord~~, while~~. Also, the steel wires come apart from each other ~~in a~~ in the step of molding the tire, ~~to damage~~ damaging the uniformity and durability of the product tire.

Page 3

The paragraphs on page 3, lines 1-33 has been amended as follows:

In order to solve this problem, each of Japanese Patent Laying-Open Nos. 10-292275 (1998) and 10-292276 (1998), for example, employs an unstranded metallic cord. However, cord wire materials forming the unstranded metallic cord, not shaped as a cord disadvantageously ~~come apart~~ separate from each other ~~in a~~ in the step of molding ~~a tire~~ the tire, ~~to result~~ resulting in various problems ~~in the step~~.

Japanese Patent Laying-Open No. 11-27446 (1999) discloses an example of binding unstranded cords with a wrapping wire. However, the wrapping wire bundling and shaping a plurality of steel wires locally rubs the steel wires to reduce durability. Prevention of such rubbing is limited since shaping performance is reduced when the cords are loosely bundled.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a metallic cord for reinforcing a tire which is moldable in a tire manufacturing step, without complicating the manufacturing operations and ~~keeping~~ maintaining tire strength ~~by~~ while reducing metallic cord ~~rusting and a~~ rust. Advantageously, a pneumatic tire

employing the metallic cord of the present invention for a belt layer and/or a carcass ~~and having~~ possesses excellent durability and rolling resistance.

The present invention provides a metallic cord for reinforcing a tire, formed by shaping a bundle prepared by paralleling a plurality of metallic wires having substantially circular sections, in an unstranded state, with a binder of a polymer material having a melting point of 50°C to 200°C. The ~~said~~ polymer material is preferably low-density polyethylene or medium-density polyethylene. The diameters of the said metallic wires are preferably 0.15 to 0.3 mm. The ~~said~~ binder is formed by a cord, a tape-like material or a string-type material.

The present invention also provides a pneumatic tire ~~having a~~ having the framework of a carcass toroidally extending between a pair of bead portions ~~with a~~ with the crown portion of the carcass reinforced with a belt layer consisting of at least two plies, and at least one ply of the belt layer is formed by embedding a metallic cord obtained by shaping a bundle prepared by paralleling a plurality of metallic wires having substantially circular sections in an unstranded state with a binder of polymer material having a melting point of 50°C to 200°C in rubber.

Page 4

Replace the paragraph beginning at line, through line 8, with the following new paragraph:

The present invention further provides a pneumatic tire having a framework of a carcass toroidally extending between a pair of bead portions with a crown portion of the carcass reinforced with a belt layer consisting of a plurality of plies, ~~and~~ in which at least one ply of the belt layer is formed by embedding in the rubber a metallic cord obtained by shaping a bundle prepared by paralleling a plurality of metallic wires having substantially circular sections in an unstranded state with a binder of polymer material having a melting point of 50°C to 200°C ~~in rubber~~.

Page 5

The paragraph beginning on page 5, line 16, through page 6, line 3, has been amended as follows:

After the plurality of steel wires 2 are bundled in an unstranded state, the metallic cord 1 is shaped with the binder 3 of the polymer material. The binder 3 of the polymer material can preferably be prepared from a thermoplastic resin having a melting point of 50°C to 200°C such as low-density polyethylene (melting point: 102 to 112°C), medium-density polyethylene (melting point:

110 to 120°C) or polypropylene (melting point: about 165°C), for example. A molded tire is set in a curing mold under a temperature condition of 150°C or 200°C. Therefore, the binder 3 of the polymer material shapes the steel wires 2 not to come apart from each other in the tire molding step. Under the curing condition, on the other hand, the binder 3 is melted to release the steel wires 2 from each other so that rubber readily penetrates into the clearance between the steel wires 2. The polymer material forming the binder 3 diffuses into the peripheral rubber in the curing step. If the melting point of the binder 3 exceeds 200°C, ~~therefore,~~ the binder 3 is not melted under the curing condition, and thus the rubber insufficiently penetrates into the metallic cord 1 and the required effects cannot be expected. If the melting point of the binder 3 of the polymer material is less than 50°C, the binder 3 readily flows ~~upon~~ with a slight temperature rise in a tire manufacturing step and thus cannot ~~attain a~~ attain its shaping function. Therefore, the melting point of the binder 3 is preferably 100°C to 200°C.

Page 6

Replace the paragraph beginning at line 4, through line 7, with the following new paragraph:

The binder 3 can be formed by working the aforementioned

polymer material into the shape of a tape of 5 to 20 mm in width, a string or fiber or stranding a plurality of fibrous materials into a cord, or may have a ~~shape selected from various ones~~ variety of shapes.

The paragraphs on page 6, lines 23-32, has been amended as follows:

~~The~~ Thus the inventive metallic cord can be embedded in a belt layer for manufacturing a pneumatic tire.

Fig. 3 is a sectional view showing the right half of a pneumatic tire 4 according to the present invention. Referring to Fig. 3, the pneumatic tire 4 has a framework of a carcass 6 toroidally extending between a pair of bead portions 5, while a crown portion of the carcass 6 is reinforced by a belt layer 7 consisting of at least two plies and a tread portion 8 is arranged on the outer side of the belt layer 7 ~~along the diametral~~ in the diameter direction of the tire 4. The aforementioned metallic cord forms at least one of the plies of the belt layer 7.

The paragraphs beginning on page 6, line 33, through page 7, line 22, has been amended as follows:

While the metallic cord is preferably formed by two to 15

metallic wires, two to six metallic wires are preferably applied to a belt layer of a radial tire for a passenger car in general. In order to attain prescribed rigidity of the belt layer with metallic cords each formed by a single metallic wire, the number of ends of the metallic cords must be increased in the ply. ~~Therefore,~~ If the space between the metallic cords is ~~so~~ too ~~narrowed~~ narrow that rubber readily separates from the ends of the metallic cords on both ends of the belt layer. This propagates between adjacent ~~ones of the~~ metallic cords to readily induce separation of the ply on both ends of the belt layer.

When the number of metallic wires forming each metallic cord exceeds 15, on the other hand, the rigidity of the belt layer is excessively increased to adversely affect the ~~deteriorate~~ comfortableness of a passenger car employing a radial tire ~~dedicated to a passenger car~~. When employing two to six metallic wires for each metallic cord of the aforementioned tire for a passenger car, the count of the metallic cords in the belt layer is 10 to 50, preferably 20 to 40 per width of 50 mm.

The metallic cord is embedded in rubber through a topping step for covering the metallic cord with rubber heated to 50°C to 120°C. In this case, the aforementioned binder may be melted so that the rubber readily penetrates into clearances between the metallic wires

forming the metallic cord. The ply of the belt layer obtained in this manner has no such problem that the metallic wires separate ~~come apart~~ from each other in the later process steps.--

Page 7

The paragraph on page 7, lines 28-29, has been amended as follows:

According to the present invention, ~~such~~ metallic cords ~~are~~ can be embedded in a carcass of a pneumatic radial tire for a truck or a bus.

The paragraphs beginning on page 7, line 30, through page 8, line 15, has been amended as follows:

Fig. 4 is a sectional view showing the right half of a pneumatic radial tire 14 for a truck or a bus according to the present invention. Referring to Fig. 4, the pneumatic radial tire 14 for a truck or a bus has a framework of a carcass 16 toroidally extending between a pair of bead portions 15 and a crown portion of the carcass 16 is reinforced with a belt layer 17 consisting of four plies, while a tread portion 18 is arranged on the outer side of the belt layer 17 ~~along the diametral~~ in the direction of the diameter of the tire 14 and a bead apex 19 is arranged between the carcass 16

and its folded portion. The aforementioned metallic cords form the plies of the carcass 16.

While each metallic cord is preferably formed by two to 15 metallic wires, in general, five to 10 metallic wires are preferably applied to the pneumatic radial tire 14 for a truck or a bus [in general]. While the count of the metallic cords in the plies must be adjusted in order to supply prescribed rigidity to the carcass 16, the space between the metallic cords is narrowed if the number of wires forming each metallic cord is small to readily cause abrasion between the metallic cords or separation of rubber from the ~~an~~ end 16a of the carcass 16. This propagates between adjacent ~~ones of the~~ metallic cords, to readily induce separation of the plies on the folded portion of the carcass 16.

Page 8

The paragraphs beginning on page 8, line 21, through page 9, line 1, has been amended as follows:

The metallic cord forming the carcass 16 is embedded in the rubber through the aforementioned topping step. In this step, the metallic cord is covered with the rubber heated to 50°C to 120°C, similarly to the case of manufacturing the belt layer. In this case, the aforementioned binder is melted and the rubber readily

penetrates into the clearances between the metallic wires forming the metallic cord. The plies of the carcass 16 obtained in this manner have no such problem that the metallic wires separate ~~come apart~~ from each other in a later process step.

According to the present invention, the carcass 16 is formed by at least one ply having the embedded metallic cord arranged in a direction of 70° to 90° with respect to the circumferential direction of the tire. A reinforcing layer of a steel cord, an aramid fiber cord, a polyester fiber cord or a nylon fiber cord can be arranged on the inner or outer side of the carcass 16 for reinforcing ~~a bead~~ the bead portion ~~of a~~ of the side wall portion of the tire.--

Page 9

The paragraph beginning on page 9, lines 7-16, has been amended as follows:

In the pneumatic radial tire 14 for a truck or a bus, the belt layer 17 is formed by four plies. In a structure generally employed for such a radial tire for a truck or a bus, the plies are stacked at a cord angle in the range of 5 to 30° with respect to the circumferential direction of the tire 14~~, for~~. For example, ~~while~~ the ply adjacent to the carcass 16 may be set to a cord angle of 40

to 70° while setting the cord angle of the remaining three plies at 5 to 30° ~~in general~~. The belt layer 17, preferably formed by the metallic cord according to the present invention, may be formed by a generally employed steel cord or glass fiber, or a combination of ~~such~~ an inorganic fiber cord and an aramid fiber cord, a nylon fiber cord or a polyester fiber cord.